

REMARKS

Claims 21-24 and 31-38 are all of the claims presently pending in the present Application. Claims 21 and 31-32 have been amended to further define the invention. Claim 24 has been canceled. Claims 33-38 have been added to claim additional features of the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claim 31 stands rejected upon informalities (e.g., 35 U.S.C. § 112, second paragraph).

Claims 21, 23, 31 and 32 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by JP60-175420 (hereinafter, "JP '420"). Claim 22 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP '420 in view of Inayoshi (U. S. Patent. 6,628,078). Claim 24 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP '420 in view of Yamazaki et al. 4,987,008.

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

Applicant's invention, as recited in claim 1, is directed to a method for manufacturing a group III nitride compound semiconductor device, including irradiating a surface of a wafer with ultraviolet rays to thereby clean a resist residue from the surface of the wafer, **the surface including group III nitride compound semiconductor**. The ultraviolet rays cause a reaction of oxygen molecules to form stimulated oxygen atoms having a strong oxidative power at the surface.

As noted in the Application, conventional surface (e.g., wafer surface) cleaning methods use O₂ plasma treatment. However, a group III nitride compound semiconductor (e.g., a p-type semiconductor layer) may have a high electrical resistance and, therefore, may be damaged by this method (Application at page 3, lines 2-12).

The claimed invention, on the other hand, irradiates a surface of a wafer with ultraviolet rays to clean a resist residue from the surface of the wafer, **the surface including a**

group III nitride compound semiconductor (e.g., p-type semiconductor). This may help to effectively clean the surface, without damaging the group III nitride compound semiconductor (Application at page 20, lines 5-12).

II. THE 35 U.S.C. 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claim 31 is indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Applicant would point out the claim 31 has been amended to delete the term "light-emitting device" to address the Examiner's concerns.

Therefore, Applicant would respectfully submit that claim 31 is not indefinite.

III. THE ALLEGED PRIOR ART REFERENCES

A. JP '420

The Examiner alleges that JP '420 teaches the claimed invention of claim 21. Applicant would submit, however, that there are elements of the claimed invention which are neither taught nor suggested by JP '420.

JP '420 discloses a pattern forming method in which a defect 4 in a resist film formed on a gold film 9 is detected, and then a finely condensed ultraviolet ray 10 is emitted to the detected defect to allegedly remove the defect (JP '420 at Abstract).

Applicant would submit, however, that JP '420 does not teach or suggest *"irradiating a surface of a wafer with ultraviolet rays to thereby clean a resist residue from said surface of said wafer, said surface comprising a group III nitride compound semiconductor"* (emphasis added) as recited in claim 21.

As noted above, unlike conventional surface cleaning methods which use O₂ plasma treatment, the claimed invention irradiates a surface of a wafer with ultraviolet rays to clean a resist residue from the surface (e.g., see Application at Figure 4). Importantly, the surface includes a group III nitride compound semiconductor (e.g., p-type semiconductor).).

This may help to effectively clean the surface, without damaging the group III nitride compound semiconductor (Application at page 20, lines 5-12).

Clearly, this feature is not taught or suggested by JP '420. Indeed, the Examiner attempts to rely on the Abstract and on page 86, left bottom column to support his allegations.

However, these passages merely disclose emitting a finely condensed ultraviolet ray to a defect in a resist film formed on a gold film in order to allegedly remove the defect. Specifically, as illustrated in Figures 2(a) and 2(b), JP '420 teaches only that the resist residue 4 can be "cleaned" from the surface of a gold film 9.

This is completely different, however, from the claimed invention in which a wafer surface including a group III nitride compound semiconductor (e.g., p-type semiconductor) is irradiated with ultraviolet rays to clean a resist residue from the surface. Indeed, the gold film 9 in JP '420 certainly could not be reasonably equated with a group III nitride compound semiconductor.

Further, Applicant would point out that an important object of the exemplary aspects of the claimed invention, is to provide a method which can effectively clean a surface of a group III nitride compound semiconductor without damaging the group III nitride compound semiconductor. Applicant notes that since JP '420 merely teaches emitting an ultraviolet ray onto a gold film (i.e., not a group III nitride compound semiconductor), JP '420 has little reason to be concerned with damaging the material of the surface (e.g., gold) to be cleaned.

In addition, the ultraviolet rays in the claimed invention are not necessarily "finely condensed" as in JP '420, but instead the ultraviolet rays may be irradiated over an entire surface of said wafer (e.g., see Application at Figure 3). Further, JP '420 does not teach or suggest supplying oxygen to the surface of the wafer, and certainly does not teach or suggest that the ultraviolet rays cause a reaction of oxygen molecules to form stimulated oxygen atoms having a strong oxidative power at the surface of the wafer. Therefore, JP '420 is completely unrelated to the claimed invention, and the Examiner's position is clearly unreasonable.

Therefore, Applicant would submit that there are elements of the claimed invention that are not taught or suggest by JP '420. Therefore, the Examiner is respectfully requested to withdraw this rejection.

B. Inayoshi (U. S. Patent No. 6,628,078)

The Examiner alleges that Inayoshi would have been combined with JP '420 to form the invention of claim 22. Applicant would submit, however, that Inayoshi would not have been combined with JP '420 and even if combined, the combination would not teach or

suggest each and every element of the claimed invention.

Inayoshi discloses a dry cleaning device which uses a double-cylinder type dielectric barrier discharge lamp as an ultraviolet source (Inayoshi at Abstract).

However, Applicant would submit that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems and solutions. Specifically, JP '420 is directed to a pattern forming method, whereas Inayoshi is directed to a dielectric barrier discharge lamp for a dry cleaning device. Therefore, these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant would submit that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, Applicant would point out that nowhere do the references teach or suggest their combination as alleged by the Examiner. Therefore, the Examiner's allegations are insufficient to support the alleged combination.

Moreover, Applicant would submit that neither JP '420, nor Inayoshi, nor any combination thereof teaches or suggest *"irradiating a surface of a wafer with ultraviolet rays to thereby clean a resist residue from said surface of said wafer, **said surface comprising a group III nitride compound semiconductor**"*, (emphasis added) as recited in claim 21. As noted above, this feature may help to effectively clean the surface, without damaging the group III nitride compound semiconductor (Application at page 20, lines 5-12).

Clearly, this feature is not taught or suggested by Inayoshi. Indeed, Applicant would point out that the Examiner has not alleged that this feature is not taught or suggested by Inayoshi, but is merely relying on Inayoshi as allegedly disclosing using an ultraviolet light having a 172 nm wavelength to decompose an organic substance.

In fact, Inayoshi merely discloses exposing a workpiece 40 to the ultraviolet light from the UV light source (Inayoshi at col. 8, lines 60-66). Inayoshi may teach that the workpiece 40 may include a semiconductor wafer (e.g., Inayoshi at col. 1, lines 13-15), but nowhere does Inayoshi teach or suggest that the workpiece 40 may include a **group III nitride compound semiconductor**. Therefore, Inayoshi clearly does not make up for the deficiencies of JP '420.

Therefore, Applicant would submit that JP '420 would not have been combined with

Inayoshi and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. Yamazaki

The Examiner alleges that JP '420 would have been combined with Yamazaki to form the invention of claim 24 (which has been canceled and the features thereof included in claim 21). Applicant would submit, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Yamazaki discloses a method of forming a film which is intended to avoid damage on the surface of semiconductor. The Yamazaki method includes generating an active halogen or active hydrogen by a photochemical reaction, and cleaning the surface of the semiconductor by removing oxide formed thereon by means of the active elements (Yamazaki at Abstract).

Applicant would submit, however, that neither JP '420, nor Yamazaki, nor any combination thereof teaches or suggests suggest *"irradiating a surface of a wafer with ultraviolet rays to thereby clean a resist residue from said surface of said wafer, said surface comprising a group III nitride compound semiconductor"*, (emphasis added) as recited in claim 21.

Clearly, these features are not taught or suggested by Yamazaki. Indeed, the Examiner attempts to rely on col. 8, line 57 in Yamazaki to support his position. However, this is clearly unreasonable.

In fact, this passage merely discloses forming a p-type semiconductor on a substrate. However, on top of the p-type semiconductor are formed many additional layers, including an N+ layer to a thickness of 1000 to 2000 angstroms, and a gold layer having a thickness of 3000 angstroms. Thus, even assuming (arguendo) that Yamazaki teaches a p-type semiconductor, nowhere does Yamazaki teach or suggest irradiating a surface including a group III nitride compound semiconductor with ultraviolet rays.

Further, even assuming (arguendo) that Yamazaki discloses irradiating a surface of a p-type semiconductor, Yamazaki clearly teaches that the purpose of his method is to remove

oxides, not to clean a resist residue from the surface of a p-type semiconductor.

Applicant would submit that **removing oxides is completely different from cleaning a resist residue**. Indeed, in the claimed invention, the ultraviolet rays cause a reaction to form stimulated oxygen atoms having a strong oxidative power. Clearly, no person of ordinary skill in the art would consider using the Yamazaki teachings (e.g., of removing oxides) to form the claimed invention which uses ultraviolet rays to form oxygen atoms having a strong oxidative power at the surface of the wafer. Thus, Yamazaki clearly does not make up for the deficiencies of JP '420.

Thus, even assuming (arguendo) that Yamazaki discloses a p-type semiconductor, Yamazaki clearly does not teach or suggest irradiating a surface of a wafer with ultraviolet rays to thereby clean a resist residue from the surface of the wafer, the surface including a group III nitride compound semiconductor, (emphasis as in the claimed invention).

Therefore, Applicant would submit that these references would not have been combined as alleged by the Examiner and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

IV. FORMAL MATTERS AND CONCLUSION

Applicant submits concurrently herewith a proposed Replacement Drawing Sheet for Figure 1, to add the designation "10" to address the Examiner's concerns (e.g., see Application at page 14, lines 11-14). Applicant would also point out to the Examiner that the light-transmissible electrode 16 is discussed in the present Application at page 19, lines 12-16.

In view of the foregoing, Applicant submits that claims 21-24 and 31-38, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

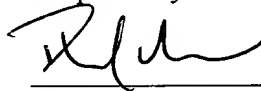
Serial No. 09/935,699
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The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

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Respectfully Submitted,



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